ASYMMETRY.

By Rev. Desmond Murray.

(Plate III.)

The duplicate parts of the internal organs of Lepidoptera are remarkably constant in the greater majority, but in comparatively rare cases there is a want of symmetry, i.e., the organs are not alike on two sides.

The late Mr F. N. Pierce found that such various parts of the genital organs as the valves, the juxta and the vinculum were occasionally so affected, especially in the case of the valves and their armature. He has shown conclusively by his life's work, on the interesting comparison of the genitalia, that species can be differentiated by these organs where other means fail.

Wing markings, colour, size, and similar external factors are often affected by environment and show considerable variation, but this does not apply to the internal organs, which remain unchanged. For this reason the examination of the genitalia is considered by many to be the best means of distinguishing and separating one species from another; the study of all the characters in combination, nevertheless, is necessary.

The seven volumes, which Pierce has left us, cover the genitalia of practically all our native species, of Lepidoptera, and must remain the key, as well as the source of additional knowledge, reaching into the vast field of the same and other families of Lepidoptera throughout the world.

"The study of the whole order of Lepidoptera has convinced me," Pierce says, "that the genitalia throughout the order have been developed on the lines of a common plan, which has been so far modified as to suit the requirements of each individual group. Some of the parts may be atrophied or even absent, others decorated with elaborate armature, others much displaced, others now free, now fused together, but the main features remain common to all the groups." (*Introd. Gen. Geomet.*)

The subject of asymmetry is the only one point considered in this short paper.

Want of symmetry appears to affect particular genera and even groups, the examples being found to be constant, not just chance abortions. In one place (*Gen. Geomet.*, 1914, p. 12) Pierce says:— "Asymmetry in species seems to denote transitional forms," a remark that gives promise of a fruitful line of investigation. The proportion affected is certainly small, perhaps 2 to 3 per cent. at the most. Asymmetry cannot be correctly called an abnormal form—it is rather an irregularity, a form of variation or mutation since it occurs constantly in certain species. What, then, is the explanation of it and why does it occur? The suggestion made by Pierce is, as far as the writer knows, the only one given so far by any writer. In fact, the question does not seem to have been discussed.

According to Meyrick's laws:—

(1) No new organ can be produced except as a modification of some previously existing structure.

(2) A lost organ cannot be regained.
(3) A rudimentary organ is rarely re-developed.

How then are such irregular forms as these affected? If they are in a transitional stage they must either be the remains or relics of some lost organ, or the modification of an existing one, yet in neither case does the cause for such an irregularity seem to be explained.

They occur constantly in the particular case, in the same way as the normal and symmetrical form occurs. If one reverts to the time factor, there is at present no evidence to show when and how they were modified. The above laws, then, do not explain their occurrence.

Chitin, of which these organs are made, is a hard substance that defeats almost every known method of section cutting. It is softened to some extent by long immersion in spirit soap but is not destroyed, even when of slight density, when soaked in caustic potash for 24 hours. How, then, can these organs be affected by environmental conditions? As easily expect the shape of animals' bones to be changed by the elements as to conclude that these organs be affected by environment.

Amongst our own Noctuae, *Miselia oxyacanthae* (Green Brindled Crescent) is certainly a most remarkable form (Fig. 1), " difficult to understand," Pierce remarks. Many of the *Pterophoridae* also show constant asymmetry—*monodactyla* (A common Plume) is a good example (Fig. II).

In the first case the left valve is long and narrow, without corona, the clasper angulated at the base; the right valve is similar, but above the sacculus it throws out a long curved arm. In the female the ductus-bursa is complicated.

In *monodactyla* the right valve is pointed, the left rounded, the apex heavily spined. The right sacculus is atrophied. From the costa is a short spined arm, with a hooked point at the base. The left valve is double, the inner arm slender, the outer arm sigmoid. From the costa there extends a long spined arm, with a hooked point at the base. The anellus is also asymmetrical. The female organ has an unusual character, the ostium leads directly in to the bursa. These descriptions are given by Pierce.

While studying recently some moths from S. America, a few were found to show remarkable asymmetrical forms, some of which are given here. [The correct naming of the insects has been verified by the authorities of the British Museum, to whom acknowledgment is gratefully made for help given.]

The figures have been made a uniform size, but vary somewhat in size according to the expanse of the insect. They were drawn from mounts made by the author with the aid of the camera lucida to about 75 times natural size, then reduced in reproduction to less than half that size, i.e., to approximately × 30. Birch collected in N.E. Brazil, 1907-12. Foster at Sapucay, Paraguay, 1902-04.

Euglyphia hieroglyphica, Cram. Fig. III. Exp. 20 mm.—Forewing dull yellow with a double row of small black spots on subterminal line, a thin curved bar on post-medial line, a black orbicular spot. Hindwing a uniform dull brown to black. Left valve normal, right valve developed into a large angulated blunt point about middle. N.E. Brazil, F. Birch, 1908.